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09/542,782	04/04/2000	Joseph R. Little	4298US(99-0996)	6869

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EXAMINER	
YAM, STEPHEN K	
ART UNIT	**PAPER NUMBER**
2878	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/542,782	Applicant(s) LITTLE, JOSEPH R.	
	Examiner Stephen Yam	Art Unit 2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 January 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-60* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-60* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 January 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .

4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: .

DETAILED ACTION

Drawings

1. The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on January 16, 2001 have been accepted. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: "notch" (21) (Paragraph 0051). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

3. Claim 60 is objected to because of the following informalities:

In Claim 60, "said at least one logic circuit" lacks proper antecedent basis, as there are three defined logic circuits.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1, 3, 12, 13, 16-18, 21, 23, 32, 33, and 36-38 are rejected under 35 U.S.C. 102(b) as being anticipated by Pramanik et al. US Patent No. 5,852,497.

Regarding Claim 1, Pramanik et al. teach (see Fig. 2A) a method for identifying a mark (see Col. 3, lines 43-52) comprising recesses (206) in a substrate surface (202) through at least one layer (210) formed over the mark, comprising scanning (see Col. 4, line 65 to Col. 5, line 2, Col. 5, lines 27-39) electromagnetic radiation of at least one wavelength across at least a portion of the substrate including the recess, the at least one wavelength capable of at least penetrating (see Col. 4, lines 54-56) a material substantially opaque to at least some wavelengths of electromagnetic radiation, measuring (see Col. 3, lines 39-42) an intensity of radiation of at least one wavelength reflected by different locations of said at least a portion of the substrate, detecting (see Col. 7, lines 56-67 and Col. 8, lines 6-9) locations at which said intensity changes from substantially a baseline intensity, and correlating (see Col. 3, lines 51-52) each location at which said intensity changes to identify the mark.

Regarding Claim 21, Pramanik et al. teaches (see Fig. 2A) a method of determining a destination for a semiconductor device substrate (202) comprising identifying a mark (see Col. 3, lines 43-52) comprising at least one recess (206) within a surface of the semiconductor device substrate and covered with at least one layer of material (210) by scanning (see Col. 4, line 65 to

Col. 5, line 2, Col. 5, lines 27-39) electromagnetic radiation of at least one wavelength across at least a portion of the semiconductor device substrate having the recess, the at least one wavelength capable of at least partially penetrating (see Col. 4, lines 54-56) a material substantially opaque to at least some wavelengths of electromagnetic radiation, measuring (see Col. 3, lines 39-42) an intensity of radiation of at least one wavelength reflected by different locations of said at least a portion of the semiconductor device substrate, detecting (see Col. 7, lines 56-67 and Col. 8, lines 6-9) locations at which said intensity changes from substantially a baseline intensity, and correlating (see Col. 3, lines 51-52) each location at which said intensity changes to identify the mark, and identifying (see Col. 1, lines 14-20 and 25-30) a predetermined destination for the semiconductor device substrate based on the mark.

Regarding Claims 3 and 23, Pramanik et al. teach scanning effected over a portion of the wafer comprising semiconductor material (silicon substrate) where the mark is located (see Fig. 2A).

Regarding Claims 12 and 32, Pramanik et al. teach the scanning effected from above the substrate (see Fig. 2A).

Regarding Claims 13 and 33, Pramanik et al. teach the scanning effected at a non-perpendicular angle relative to the substrate (see Fig. 2A).

Regarding Claims 16 and 36, Pramanik et al. teach the intensity measurement using a reflectometer (see Col. 3, lines 39-43 and Col. 5, lines 46-50).

Regarding Claims 17 and 37, Pramanik et al. teach identifying the location in which said electromagnetic radiation was reflected (θ_2, θ_3 – see Fig. 2A and Col. 6-8).

Regarding Claims 18 and 38, Pramanik et al. teach identifying the location in which said electromagnetic radiation was directed (θ_I- see Fig. 2A and Col. 3, lines 38-43).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 2, 6-11, 14, 15, 22, 26-31, 34, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pramanik et al.

Regarding Claims 2 and 22, Pramanik et al. teach the method as taught in Claims 1 and 21, according to the appropriate paragraph above. Pramanik et al. do not teach raster scanning for the light source. It is well known in the art to use raster scanning as a conventional method of scanning a beam of light for detection, as it is the most straightforward and simple procedure of directing light. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use raster scanning in the method of Pramanik et al., to utilize a well-known process for light scanning and provide a straightforward system for illumination of the edges.

Regarding Claims 6-11 and 26-31, Pramanik et al. teach the method as taught in Claims 1 and 21, according to the appropriate paragraph above. Pramanik et al. also teach (see Col. 3, lines 30-40) determining the optimal wavelength to use according to the type and thickness of the opaque layer. Pramanik et al. do not teach emitting the light wavelengths as claimed. It is

well known in the art to use different wavelengths of light to penetrate different materials, depending on the composition of the material, and that wavelengths outside of the absorption range of the material do not penetrate the material and hence do not affect the detection of the mark. It would have been obvious to one of ordinary skill in the art at the time the invention was made to the light wavelengths as claimed in the method of Pramanik et al., to enable scanning of the alignment mark for different polysilicon layer compositions and utilize various light sources emitting a wide wavelength range.

Regarding Claims 14, 15, 34, and 35, Pramanik et al. teach the method as taught in Claims 1 and 21, according to the appropriate paragraph above. Pramanik et al. also teach the alignment process where the wafer is positioned with respect to the surrounding components (see Col. 1, lines 14-20 and 25-30). Pramanik et al. do not teach moving a source of electromagnetic radiation relative to the substrate or moving the substrate relative to the source. It is design choice as to which component is actually moved, as long as both components of the system are repositioned relative to each other. It would have been obvious to one of ordinary skill in the art at the time the invention was made to move either the source or the substrate in the method of Pramanik et al., to enable the most delicate component to remain static while moving the other component, to prevent damage to the components while performing the alignment process.

8. Claims 4, 5, 19, 20, 24, 25, 39-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pramanik et al. in view of Bareket US Patent No. 5,889,593.

Regarding Claims 4, 5, 24, and 25, Pramanik et al. teach the method as taught in Claims 1 and 21, according to the appropriate paragraph above. Pramanik et al. do not teach directing and

measuring the intensities of a plurality of wavelengths from the radiation source. Bareket teaches directing and measuring intensities of a plurality of wavelengths from a radiation source reflected off the substrate (see Col. 5, lines 10-18). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a plurality of wavelengths as taught by Bareket in the system of Pramanik et al., to provide detection from multiple penetration characteristics of the opaque layer for improved mark detection and recognition through varied contrast between each wavelength.

Regarding Claims 19, 20, 39 and 40, Pramanik et al. teach the method as taught in Claims 1 and 21, according to the appropriate paragraph above. Pramanik et al. do not teach mapping the location at which the intensity of electromagnetic radiation varies from baseline intensity or recognizing the mark based on the mapping. Bareket teaches (see Fig. 3) a detection system for a mark on a semiconductor substrate with a radiation source (50), a reflectometer (72, 73, 74, 76, 78) to receive electromagnetic radiation reflected from the substrate, and a processor (82, 138) for analyzing an intensity (see Col. 7, lines 49-55) of electromagnetic radiation of said at least one wavelength reflected from said location of said substrate, comparing (see Col. 7, lines 55-60) the detected intensity to a baseline intensity, under control of a computer program (running on the processor (82)), storing (see Col. 9, lines 34-37) in memory the location where the intensity varies from the baseline intensity, mapping (see Col. 8, lines 11-15) the locations where an intensity varies from a baseline intensity (as multiple locations are mapped and the measurement locations and data are stored in memory) (see Col. 9, lines 34-37), and identifying (see Col. 8, lines 50-56) a surface feature based on the mappings, under the control of at least one program (running on the processor (138)). It would have been obvious to one of ordinary skill in the art at

the time the invention was made to use the mapping and recognizing functions of the processor in Bareket in the method of Pramanik et al., to efficiently provide determination and location of the alignment mark in order to correctly align the semiconductor wafer as desired by Pramanik et al. (see Col. 1, lines 25-30 and Col. 2, lines 59-64).

Regarding Claims 41, 55, and 56, Pramanik et al. teach (see Fig. 2A) a system for identifying a surface feature (206) of a substrate (202) covered by at least one layer of material (210) comprising at least one radiation source (see Col. 4, line 65 to Col. 5, line 2, Col. 5, lines 27-39) configured and positioned to direct electromagnetic radiation of at least one wavelength towards the substrate, the wavelength capable of at least partially penetrating (see Col. 4, lines 54-56) a material substantially opaque to at least some wavelengths of electromagnetic radiation, and at least one reflectometer (see Col. 3, lines 39-42) positioned so as to receive electromagnetic radiation of said at least one wavelength reflected from a location of said substrate covered with the wavelength-specific-opaque material. Pramanik et al. also teach the detection of the boundary edge from the mark (see Col. 3, lines 49-52). Regarding Claim 55, Pramanik et al. teach a radiation source positioned to emit incident radiation (see Fig. 2A) toward an active surface (204,210) of said substrate. Regarding Claim 56, Pramanik et al. teach the incident radiation emitted towards an active surface (204, 210) of the substrate at a non-perpendicular angle (see Fig. 2A). Pramanik et al. do not teach at least one processor associated with said reflectometer for analyzing an intensity of electromagnetic radiation of said at least one wavelength reflected from said location of said substrate. Bareket teaches (see Fig. 3) a detection system for a mark on a semiconductor substrate with a radiation source (50), a reflectometer (72, 73, 74, 76, 78) to receive electromagnetic radiation reflected from the

substrate, and a processor (82, 138) for analyzing an intensity (see Col. 7, lines 49-55) of electromagnetic radiation of said at least one wavelength reflected from said location of said substrate. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a processor for analyzing an intensity of the reflected wavelength as taught by Bareket in the system of Pramanik, to use standard processing equipment for providing pattern recognition of the alignment mark, to save production costs and simplify system design.

Regarding Claims 42-45, Pramanik et al. in view of Bareket teach the system as taught in Claim 41, according to the appropriate paragraph above. Pramanik et al. do not teach comparing the detected intensity to a baseline intensity. Bareket teaches (see Col. 7, lines 55-60) logic circuits for comparing the detected intensity to a baseline intensity, under control of a computer program (running on the processor (82)), storing (see Col. 9, lines 34-37) in memory the location where the intensity varies from the baseline intensity, mapping (see Col. 8, lines 11-15) the locations where an intensity varies from a baseline intensity (as multiple locations are mapped and the measurement locations and data are stored in memory) (see Col. 9, lines 34-37), and identifying (see Col. 8, lines 50-56) a surface feature based on the mappings, under the control of at least one program (running on the processor (138)). It would have been obvious to one of ordinary skill in the art at the time the invention was made to compare the detected intensity to a baseline intensity, store the locations of variances, and map the locations in the system of Pramanik et al. in view of Bareket, to measure an entire area for an alignment mark and provide a detailed contour mapping of the substrate.

Regarding Claim 46, Pramanik et al. in view of Bareket teach the system as taught in Claim 41, according to the appropriate paragraph above. Pramanik et al. also teach the

alignment process where the wafer is positioned with respect to the surrounding components (see Col. 1, lines 14-20 and 25-30). Pramanik et al. do not teach an actuation apparatus for moving the radiation source or the substrate. Bareket teaches an actuation apparatus (132) (see Fig. 7) for moving the substrate (see Col. 8, lines 18-28). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use an actuation apparatus as taught by Bareket in the system of Pramanik et al. in view of Bareket, to effectively move the substrate for alignment with the other components such as a stepper, as taught by Pramanik et al. (see Col. 1, lines 14-20 and 25-30).

Regarding Claims 47 and 48, Pramanik et al. in view of Bareket teach the system as taught in Claim 41, according to the appropriate paragraph above. Pramanik et al. do not teach directing and measuring the intensities of a plurality of wavelengths from the radiation source. Bareket also teaches directing and measuring intensities of a plurality of wavelengths from a radiation source reflected off the substrate (see Col. 5, lines 10-18). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a plurality of wavelengths as taught by Bareket in the system of Pramanik et al., to provide detection from multiple penetration characteristics of the opaque layer for improved mark detection and recognition through varied contrast between each wavelength.

Regarding Claims 49-54, Pramanik et al. in view of Bareket teach the system as taught in Claim 41, according to the appropriate paragraph above. Pramanik et al. also teach (see Col. 3, lines 30-40) determining the optimal wavelength to use according to the type and thickness of the opaque layer. Pramanik et al. do not teach emitting the light wavelengths as claimed. Bareket teaches emitting a light wavelengths of about 550nm (see Col. 4, line 66 to Col. 5, line 1

and Col. 13-18)- furthermore, it is well known in the art to use different wavelengths of light to penetrate different materials, depending on the composition of the material, and that wavelengths outside of the absorption range of the material do not penetrate the material and hence do not affect the detection of the mark. It would have been obvious to one of ordinary skill in the art at the time the invention was made to the light wavelengths as claimed in the method of Pramanik et al. in view of Bareket, to enable scanning of the alignment mark for different polysilicon layer compositions and utilize various light sources emitting a wide wavelength range.

Regarding Claim 57, Pramanik et al. in view of Bareket teach the system as taught in Claim 41, according to the appropriate paragraph above. Pramanik et al. and Bareket do not teach a user interface associated with the processor. It is well known in the art to use a user interface with a system processor, to provide user control and feedback to activate, deactivate, or change the parameters of the system. It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a user interface with the processor in the system of Pramanik et al. in view of Bareket, to provide human control of the specific characteristics for the light emission and detection process, and to provide specific parameters for alignment mark detection.

Regarding Claim 58, Pramanik et al. in view of Bareket teach the system as taught in Claim 41, according to the appropriate paragraph above. Pramanik et al. do not teach an output device. Bareket also teach an output device (network interface) (see Col. 9, lines 32-34) associated with at least one processor. It would have been obvious to one of ordinary skill in the art at the time the invention was made to include an output device in the system of Pramanik et

al. in view of Bareket, to link the data with a central processor through a network, as taught by Bareket (see Col. 9, lines 26-37).

9. Claims 59 and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bareket in view of Pramanik et al.

Bareket teaches (see Figs. 4 and 7) a processor (82, 138) for characterizing a recess in a substrate comprising a logic circuit (82) for comparing (see Col. 7, lines 56-67 and Col. 8, lines 6-9) a measured intensity of at least one wavelength of reflected radiation to a baseline intensity of said at least one wavelength of radiation reflected from a planar portion of said substrate, and at least one logic circuit (138) for mapping (see Col. 8, lines 11-15) a plurality of locations of said substrate where said measured intensity differs from said baseline intensity (as multiple locations are mapped and the measurement locations and data are stored in memory) (see Col. 9, lines 34-37), under control of at least a portion of at least one program (running on the processor (138)). Regarding Claim 60, Bareket teaches (see Fig. 7) a logic circuit (138) for characterizing (see Col. 8, lines 50-56) the recess based on the plurality of locations mapped by the logic circuit, under control of at least a portion of a program (running on the processor (138)). Bareket does not teach a material-covered recess. Pramanik et al. teach (see Fig. 2A) a system for identifying a mark (see Col. 3, lines 43-52) comprising recesses (206) in a substrate surface (202) through at least one layer (210) formed over the mark. It would have been obvious to one of ordinary skill in the art at the time the invention was made to scan a material-covered recess as taught by Pramanik et al. with the processor of Bareket, to provide identification information for

a semiconductor wafer for modern fabrication techniques as taught by Pramanik et al. (see Col. 2, line 49 to Col. 3, line 2).

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

David US Patent No. 6,259,525, teaches a processor for detecting and recognizing an alignment mark on a semiconductor wafer.

Kim et al. US Patent No. 6,501,189, teach a system and method of detecting an alignment mark in a semiconductor wafer, located beneath a layer opaque to selected beams of light (see Fig. 19).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen Yam whose telephone number is (703)306-3441. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (703)308-4852. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7724 for regular communications and (703)308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

S.Y.

SY
March 4, 2003

DAVID PORTA
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